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IDENTIFICATION OF EAGLE FEATHERS AND FEET

Identification Guides for Wildlife Law Enforcement No. 3

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Wildlife law enforcement officers are often called upon to examine crafted items such as headdresses, dream catchers, and dance fans that are suspected to include eagle feathers. Eagle feather identification can be challenging. The bald eagle and the golden eagle are similar in size and their flight feathers share many common features. The plumage of each species varies strongly with age, and the feathers of immature eagles in particular are easily confused. In addition, feathers of several other large birds, including geese, turkeys, and vultures, are often used in place of eagle feathers and must be ruled out during the identification process.

This section first outlines distinctive characteristics of both adult and immature golden and bald eagle feathers. Then features that distinguish eagle feathers from waterfowl, large gamebirds, vultures, and other raptors are discussed. Finally, distinctive differences between the lower legs and feet of the two eagle species are presented, allowing identification of these parts which are regularly encountered in wildlife crime cases. All major points are summarized in Table 1.

Feather Terminology

Figures 1 and 2 show the basic parts of a feather and the different types of flight feathers, illustrating terms that will be used throughout this section. The *shaft* is the stiff "quill" of the feather, from which the soft *vanes* extend on either side. The outer wing feathers, or *primaries*, are pointed, and the outermost ones show an obvious *notch* in the vane. Above the notch, the tip of the feather is narrow and finger-like. This allows the feather tip to twist, generating lift during soaring. The vanes of primaries are very unequal, with the inner vane much broader than the outer. The inner flight feathers, or *secondaries*, are rounded and the vanes are more equal on both sides of the shaft. The feathers lack a notch. The tail feathers are also rounded. The vanes on the outer tail feathers are very unequal, but they become progressively more equal toward the center of the tail. It is often difficult to distinguish secondaries and inner tail feathers.

Golden Eagle Adult

Adult golden eagles are brown overall, with no large areas of white. Most flight feathers of both wing and tail exhibit a diagnostic pattern called "marbling," which may include indistinct bars,

curved or oval markings, and small irregular patches (Fig. 2, 3, 4, and 6). These marbling markings are paler than the predominant chocolate-brown color of adult golden eagle feathers, but vary individually from medium brown to tan to almost white in unusual cases. Marbling is never seen on bald eagle feathers.

It is important to note that the outer 3 or 4 wing feathers (primaries) of golden eagles do not exhibit marbling and are a very dark, almost blackish brown (see the adult golden eagle primary in Fig. 1). These are the feathers with a prominent "notch" in the vane and elongated finger-like tips. These feathers are not commonly used in crafted items, but when they are encountered, they usually cannot be distinguished from the corresponding feathers of bald eagle without reference specimens.

Bald Eagle Adult

Adult bald eagles are one of the most distinctive birds of North America, with their pure-white heads and tails and dark gray-brown bodies (Fig. 5). The detached white tail feathers (Fig. 7) cannot be confused with golden eagle feathers, which are never all white. However, they may be confused with the white flight feathers of swans and domestic white forms of turkey and peafowl (see sections on distinguishing eagle feathers from waterfowl and gamebirds, below).

Adult bald eagle wing feathers are plain dark gray or gray-brown, sometimes with a very small whitish patch at the base (Fig. 4 and 5). They never exhibit marbling or other patterning within the vanes. As noted above, the outer primaries of both eagle species are dark and unpatterned, and usually cannot be distinguished without reference specimens.

Golden Eagle Immature

Immature golden eagles are distinguished from adults by the large amounts of white at the bases of their feathers (Fig. 3 and 6). In the flying bird, this is obvious as prominent white patches in the wing and at the base of the tail. Golden eagles attain adult plumage at 3-4 years old. Immature golden eagle feathers, with their striking white bases and dark tips, are the most highly prized eagle feathers for use in headdresses and other crafted items.

The amount of white at the base of the flight feathers varies with the location of the feather (least on outer primaries, most on inner secondaries and tail feathers) and age (most in one-year old birds), and also shows individual variation. Despite this variability, there are several consistent differences from immature bald eagle feathers. There is almost always a large part of the white patch that is pure white, without brown speckles or blotches (though there may be such speckles at the edges of the white patch). The white patch is almost always a single area extending upward from the base of the feather, not a white patch surrounded by a darker area (as in the immature bald eagle, Fig. 8). Finally, immature golden eagles often show traces of the "marbling" pattern of adults, either at the edge of the white patch (see the upper tail feather of Fig. 6) or within the brown area toward the tip of the feather.

Bald Eagle Immature

Bald eagles undergo a more complex and variable series of immature plumages than do golden eagles. Yearlings are very dark overall, while three- and four-year olds may be very light, with

large areas of white on the lower breast and belly. It typically takes five years for a bald eagle to attain full adult plumage.

This variability is seen in individual flight feathers, making immature bald eagle feathers probably the most confusing to identify. In comparison with immature golden eagle feathers, immature bald feathers look "mud-spattered," and lack large pure white patches (Fig. 5, 7, and 8). The white is marked throughout with blotches and speckles, and is often in an isolated patch (surrounded by dark) toward the middle or even the tip of the feather (Fig. 8). If a pure white patch is present at the base of the feather, it is much smaller than the comparable area on an immature golden feather. Finally, it should be noted that although immature bald feathers never show the well-developed marbling patterns seen on golden eagle feathers, there may be irregular pale markings toward the tip that somewhat resemble marbling. If this is the case, look for white areas with speckling or blotching in other parts of the feather, which will rule out golden eagle.

Distinguishing the Feathers of Large Waterfowl and Eagles

Eagle feathers are always larger than the corresponding feathers of large waterfowl (geese and swans). However, confusion may occur when dealing with detached feathers, since the location on the body where the feather originated is often uncertain.

The outer (primary) flight feathers are the longest on the wing, and are therefore the most likely to be confused for eagle. Fortunately, waterfowl primaries can be easily recognized by the presence of a waxy-looking patch lying along the shaft on the underside of the feather (Fig. 9). This is a structural-strengthening layer of the vane called "tegmen," and it is never seen on eagles. This tegmen layer is present (though less conspicuous) on the all-white primaries of swans, and should prevent confusion of swan feathers with adult bald eagle tail feathers.

Distinguishing the Feathers of Turkeys and Peafowl from Eagles

The feathers of "wild-type" turkeys and peafowl have easily recognized patterns that are familiar to wildlife officers and make confusion with eagle feathers unlikely. However, both turkeys and peafowl have many domesticated varieties with plumage that may be easily confused with eagle. Also, white turkey feathers are often dyed brown at the tip to resemble immature golden eagle feathers. Fortunately, there are two characters of the feather shaft that clearly distinguish these large game birds from eagles, regardless of the appearance of the feather vane.

The upperside of the shaft in large gamebirds (and, less obviously, in large waterfowl) is marked with a set of fine parallel lines running the length of the shaft (Fig. 10). These are inside the shaft, not grooves on its surface. They can usually be seen clearly with the naked eye, but are more obvious with a magnifying lens. In contrast, the upper side of eagle feather shafts have no such lines (Fig. 11).

Identification can be confirmed by turning the feather over and examining the shaft on the underside. In large gamebirds there is a broad, U-shaped groove running along the shaft (Fig. 12). This is most obvious in the robust lower shaft. A similar, though less pronounced, groove is present in large waterfowl feathers. In contrast, eagle feathers do not have an obvious broad groove in the under-surface of their shafts (Fig. 13). Instead, they have a fine line (as if scratched with a pin) or narrow groove (as if cut with a sharp knife).

Distinguishing the Feathers of Vultures and Eagles

The flight feathers of vultures, especially turkey vultures, resemble eagle feathers in size and shape. They range in color from brown to blackish, and never exhibit a pattern or any white patches. They are therefore most likely to be confused with adult bald eagle wing feathers. They can be readily distinguished, however, by their shafts (Fig. 14).

Turkey vultures have squared white shafts on the underside of their flight feathers, which contrast strongly with the surrounding grayish vanes. Black vultures have contrasting white shafts on both the upperside and underside of their flight feathers. Eagle flight feathers do not show this contrast between the shafts and the surrounding vanes. In dark adult eagle feathers, the upper shafts are dark (Fig. 11) and the under shafts are darkly mottled (Fig. 13). In white adult bald eagle tail feathers, the shafts are white. In immature golden eagles with white lower vanes and dark feather tips, the shafts are white where the vane is white and dark where the vane is dark (Fig. 6).

Distinguishing the Feathers of Eagles from other Raptors

Feather size is usually all that is needed to distinguish eagle feathers from those of all other North American raptors (hawks, falcons, and owls). Eagle outer wing feathers (primaries) range from 16-22 inches in total length (of which 4-5 inches is the bare shaft at the base). Eagle inner wing feathers (secondaries) and tail feathers range from 10-14 inches total length. Any wing or tail feathers less than 10 inches are unlikely to come from eagles. The primaries of all North American hawks, falcons, and owls are shorter than 14 inches, and the secondaries and tail feathers are usually less than 10 inches. The only exception is osprey, whose feathers may approach the size of a small eagle's. However, osprey flight feathers exhibit strong brown and white barring, a pattern never seen in bald or golden eagles.

In addition to size, the plumage coloration and patterns of hawks, falcons, and owls are almost always distinctly different from eagles. The exceptions are the white-and-brown tail feathers of rough-legged hawk (which can resemble immature golden eagle) and the all-dark wing feathers of Harris' hawks (which can resemble adult bald or golden eagle). In both cases, the hawk feathers are far smaller, which should prevent confusion.

Distinguishing the Feet of Bald and Golden Eagles

Identifying the feet of bald and golden eagles is much simpler than identifying their feathers. The lower legs (tarsi) of golden eagles are covered with feathers all the way to the base of the toes. In contrast, the lower legs of bald eagles are unfeathered, with exposed scaly skin (Fig. 15) This skin is usually distinctly orange-yellow in recently dead or frozen specimens, though it may fade to brownish once dried.

The massive appearance of eagle feet is immediately obvious, and should rule out confusion with any other raptors. This is easily confirmed by measurement: the central toe of both eagle species is at least 2 inches long without the talon, whereas the central toe of the next-largest North American raptors, the osprey and the ferruginous hawk, are at most 1.5 inches without the talon.

TABLE 1. SUMMARY OF EAGLE FEATHER ID TIPS

TO ELIMINATE EAGLE:

Feather CANNOT be from eagle if:

- A waxy "tegmen" layer is present on the underside of the feather along the shaft.
  ⇒ It is waterfowl (Fig. 9)
- There are fine lines running along the shaft on the top of the feather.
  ⇒ It is gamebird (most likely) or waterfowl (Fig. 10)
- There is a broad, U-shaped groove in the shaft on the underside of the feather.
  ⇒ It is gamebird (most likely) or waterfowl (Fig. 11)
- There is a strong contrast between a white feather shaft and surrounding darker vanes.
  ⇒ It is vulture (most likely) (Fig. 13)

TO IDENTIFY SPECIES OF EAGLE:

Feather CANNOT be from Bald Eagle if:

- "Marbling" pattern of paler bars and swirls is present in dark brown feather.
  ⇒ It is adult Golden Eagle (Fig. 2, 3, 4, 6)
- There is a large pure-white area at the base of the feather and a dark tip.
  ⇒ It is immature Golden Eagle (Fig. 3, 6)

Feather CANNOT be from Golden Eagle if:

- It is pure white.
  ⇒ It is adult Bald Eagle tail feather (Fig. 5, 7)
- It has white areas spattered with brown and surrounded by dark areas.
  ⇒ It is immature Bald Eagle (Fig. 5, 7, 8)

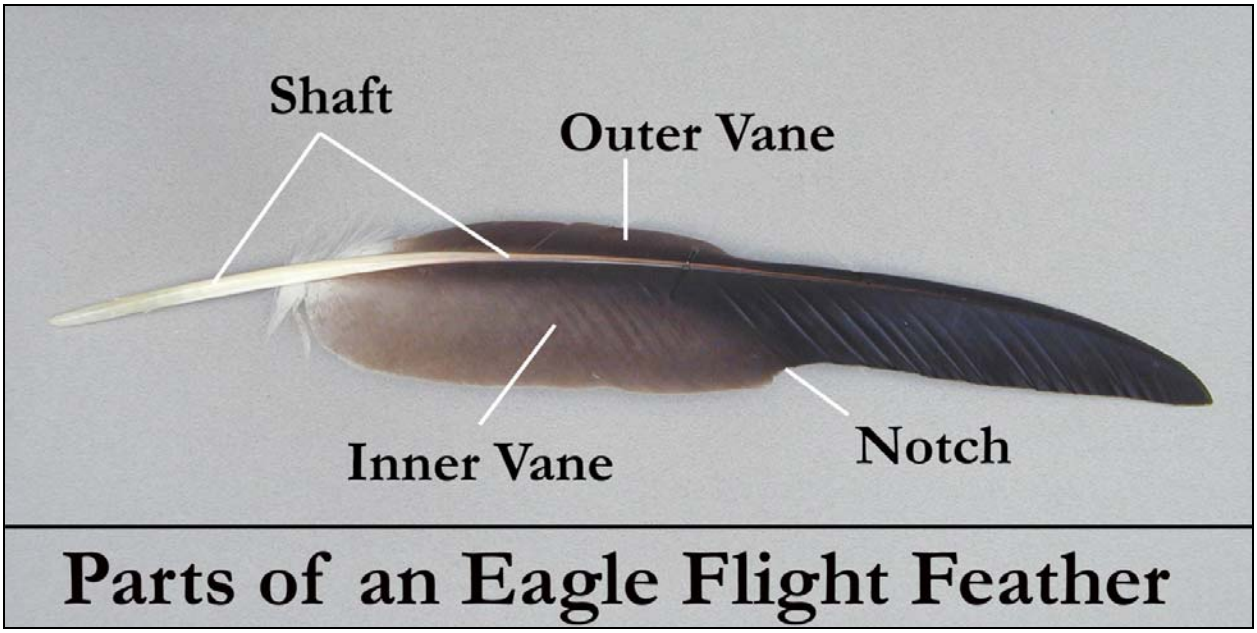


Figure 1.

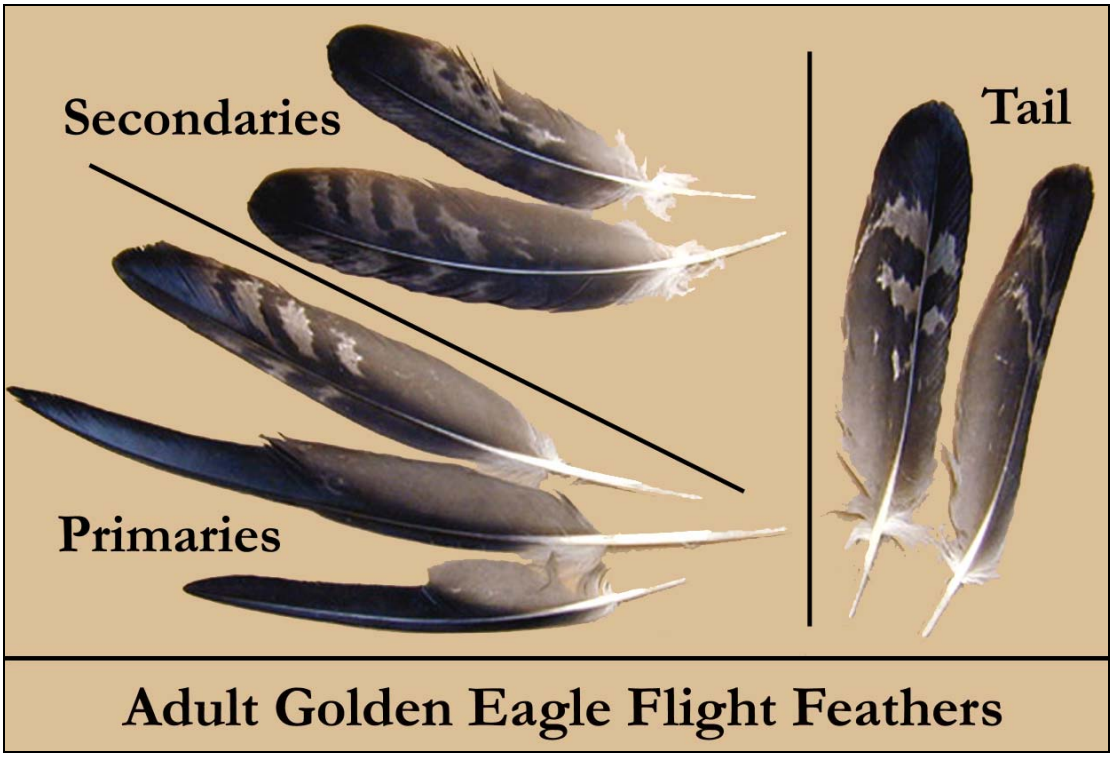


Figure 2.


GOLDEN EAGLE
PRIMARY
SECONDARY
PLUME
BODY FEATHER
Adult
Immature

Figure 3.

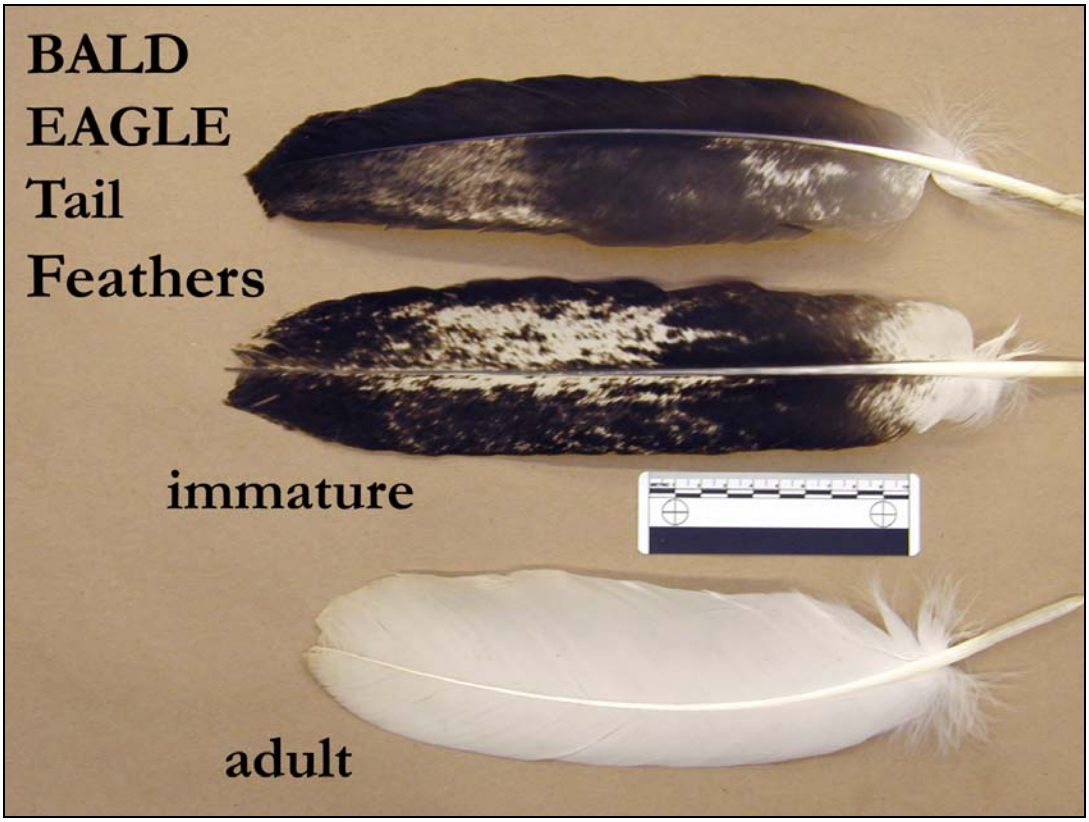

ADULT EAGLE WING FEATHERS
BALD - plain dark gray
GOLDEN - brown with marbling

Figure 4.


BALD EAGLE
PRIMARY
SECONDARY
PLUME
BODY FEATHER
Adult
Immature

Figure 5.

Figure 6.



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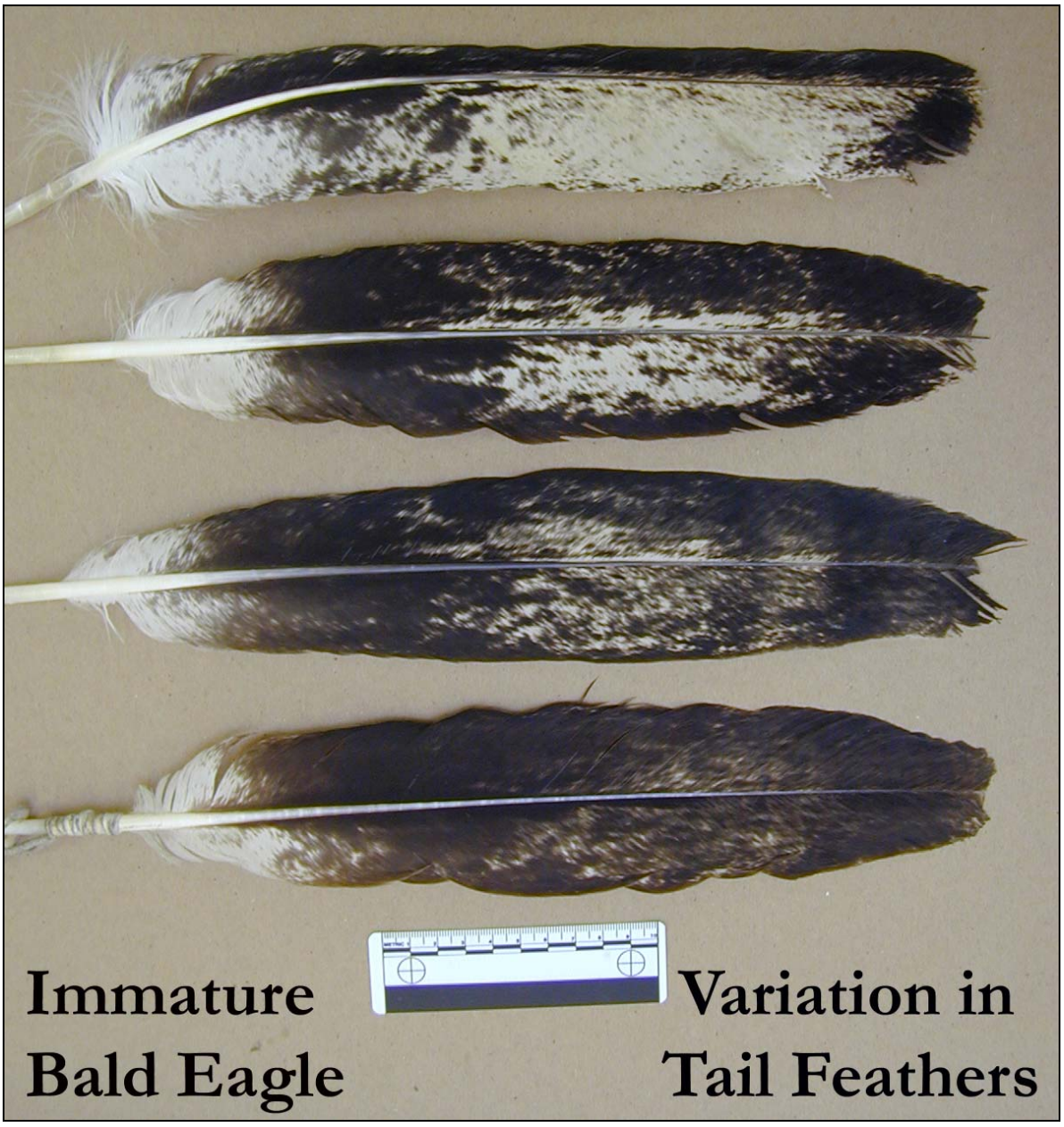

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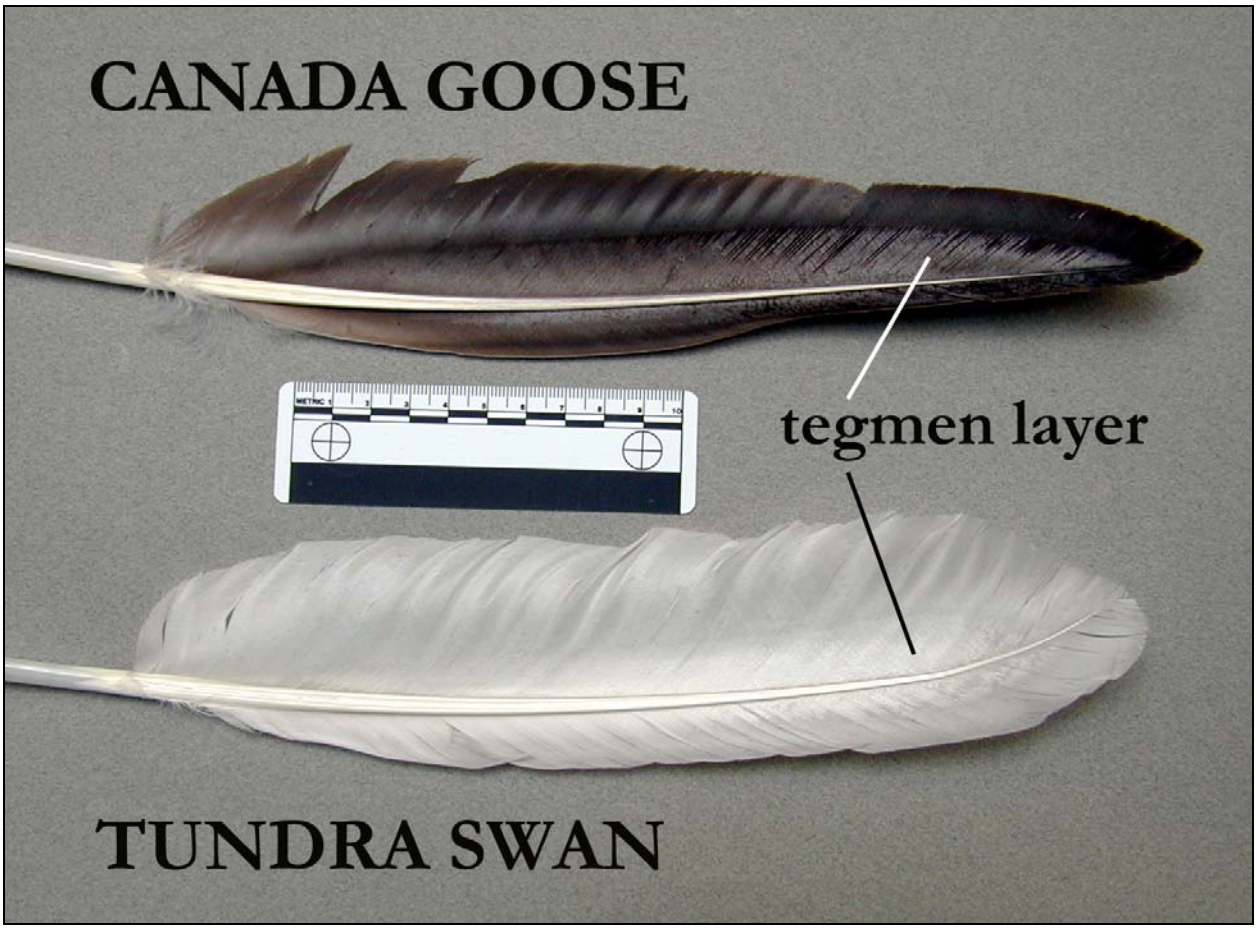

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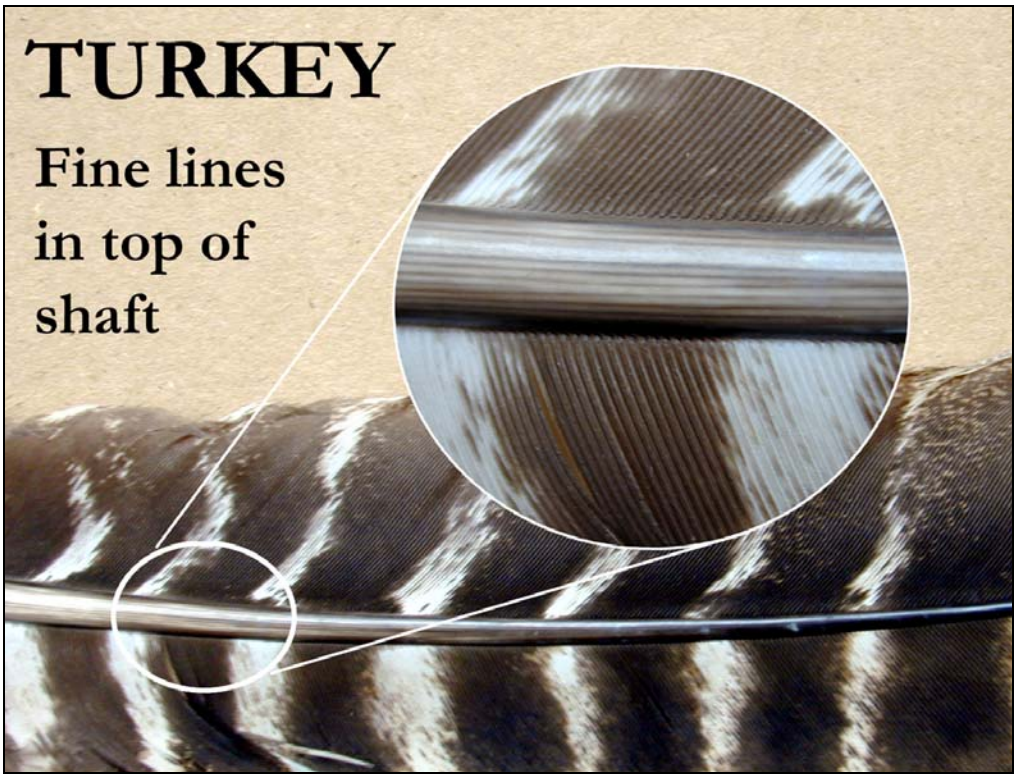

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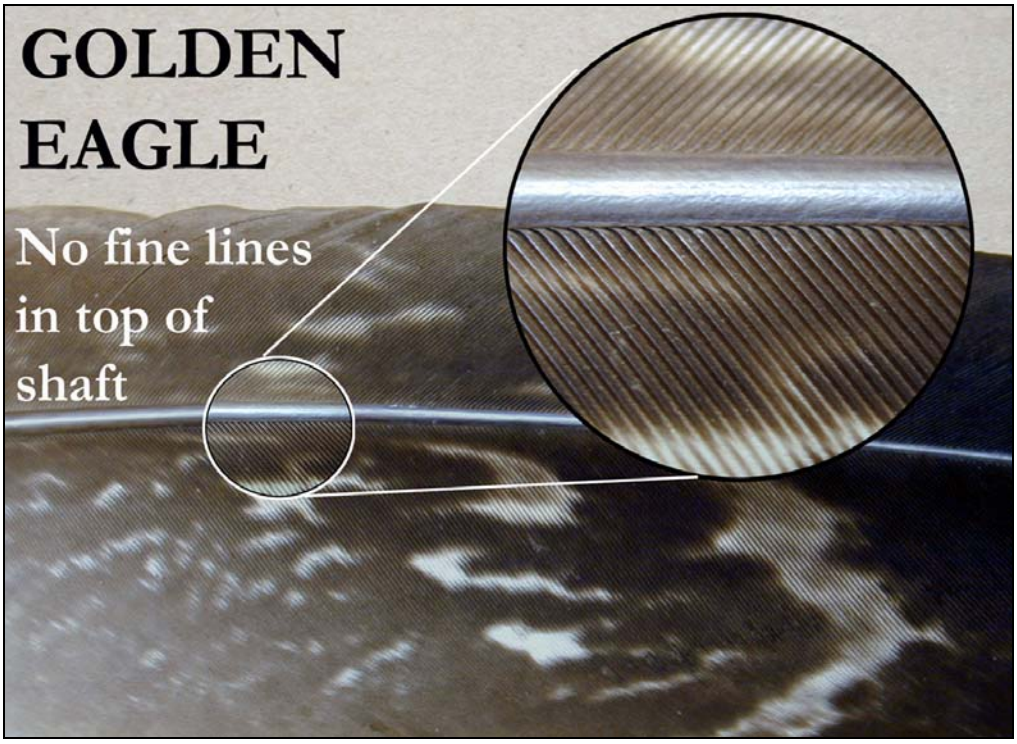

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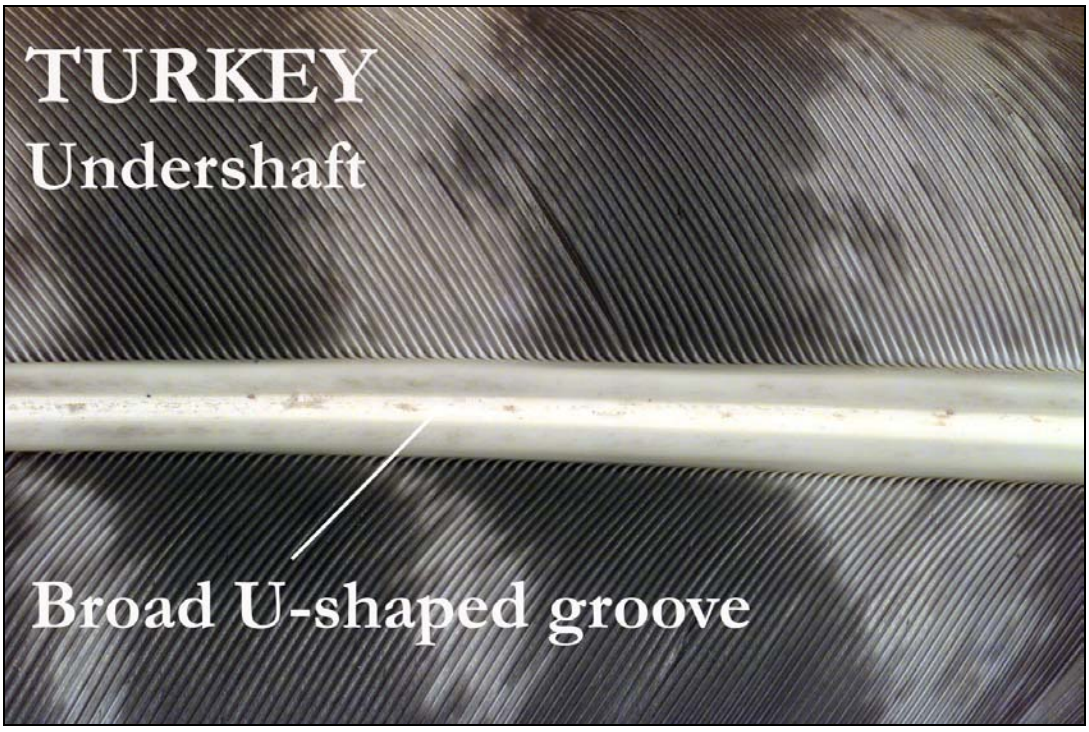

Figure 12.

Figure 13.

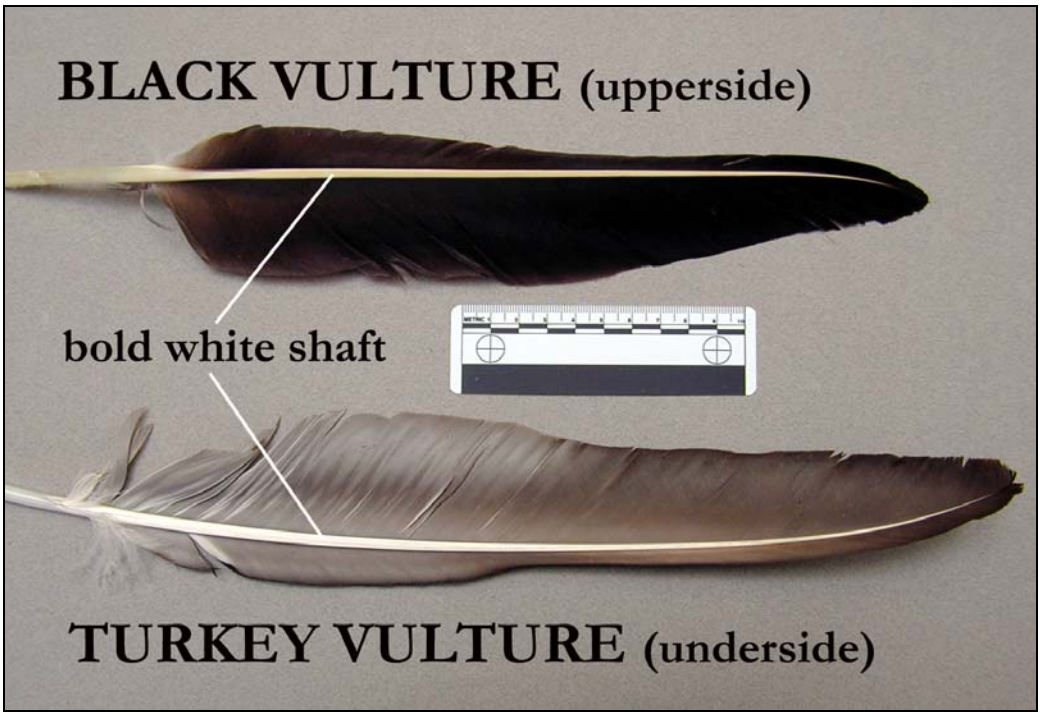

Figure 14.

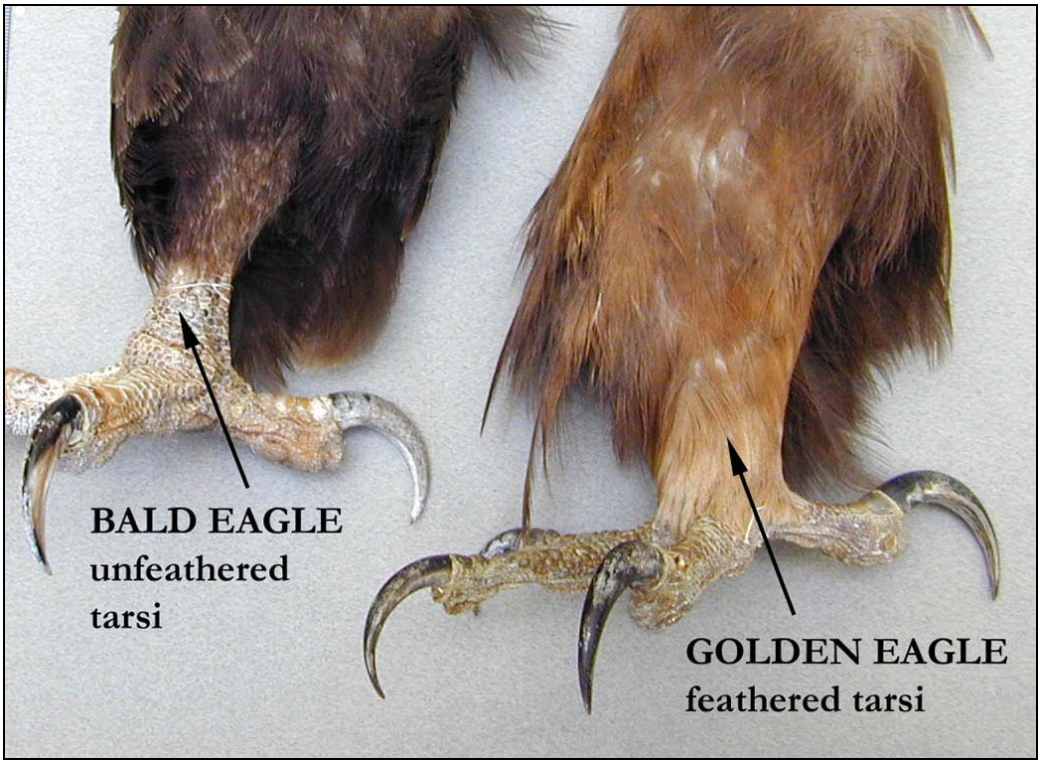

Figure 15.